Planetary Encounters

Teachers Notes

Task 1

To make things easy we've put together a table of planets and their characteristics. A great activity to do in class after your visit is to consolidate all the students answers to form a similar table on the blackboard.

Planet	Colour	Surface	Temperature	Moons	Other features
Mercury	Gray	Dusty and cratered	Hot in the day, Freezing at night	None	Similar to the Moon
Venus	Blue and White clouds, Yellow and Orange surface	Rocky with old volcanoes and ridges	Very Hot	None	Similar in size to Earth. Greenhouse weather.
Earth	White clouds, Blue oceans and different coloured land masses	Water and Rock	Just right	One	Atmosphere with Oxygen, only planet with life!
Mars	Red-Orange with white poles	Dry and sandy	Cold	Two	Sand and rocks. May have once had life. Poles and atmosphere mainly carbon dioxide.
Jupiter	Brown with White and Yellow bands	Clouds - no solid surface	Very cold	Sixteen	Big red storm and other small storms. Large moons. Small ring around planet.
Saturn	Butterscotch	Clouds - no solid surface	Very Very Cold	Eighteen	Big rings around planet. Moon called Titan which is bigger than Pluto and has atmosphere.
Uranus	Green-Blue colour	Clouds - no solid surface	Extremely Cold	Ten	Boring atmosphere. Tipped on its side. Weird moons like Miranda.
Neptune	Blue	Clouds - no solid surface	Extremely Cold	Eight	Bright atmosphere with white clouds. Dark storm. Moon Triton has cantaloupe region.
Pluto	Maybe White, Gray and Purple?	Snow and ice?	Freezing	One	Small distant planet. May have been a Neptunian moon. Moon is nearly same size as planet.

The second part of the task asks the children to describe or draw an alien that would be best suited to these conditions. This is really up to their creative thinking, however they

must remember that factors such as temperature, sunlight, surface, etc. will limit what an alien looks like. For example a woolly or furry alien would live on Pluto, but not on Venus. Feet are useless on Jupiter because it has no surface, and aliens may be taller on Mercury than on Earth because it has less gravity.

Task 2

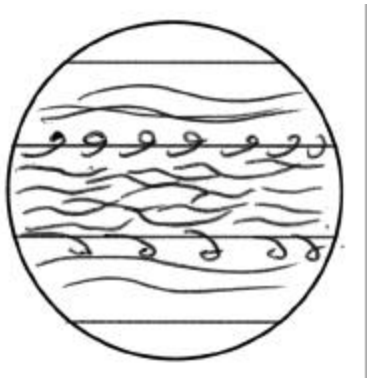
Each of the planets orbit around the Sun at different speeds. This is because the gravity felt by Mercury is stronger than that felt by distant Neptune, so it must therefore travel faster in its orbit to avoid being 'swallowed' by the Sun. Our planet, Earth, travels at over 107 000 km/hour around the Sun and it takes 365.25 days to complete an orbit. We name this a year. Every year you have a birthday and you get slightly older. What would you do if you lived on Mars? Because it take 687 days to orbit the Sun, there would be 23 months in the year and you would celebrate your birthday only half as often as your 'Earthly' cousins. It would also mean that you finish school at age 9, raise a family as early as 10 and retire at age 30.
On Venus it takes approximately 224 days for the planet to rotate and 225 days to complete one revolution around the Sun. There is only one day in a year! That means you celebrate New Years Day, Christmas, Easter and your birthday on the same day.

To calculate your age on other planets you need to first calculate your age in Earth days. To do this multiply your age in years by 365. Choose the planet you want to live on and divide its year (in days) into your age (in days). To convert it into months, multiply the result by 12.

Object	Year (days)
Mercury	88
Venus	225
Mars	687
*Ceres**	1680
Jupiter	4330
Saturn	10760
Uranus	30707
Neptune	60202
Pluto	90800

Task 3

Laminar flow is characterised by smoothly curving lines of flow. Turbulent flow is characterised by small vortices and chaotic flow. A typical diagram would look like this.

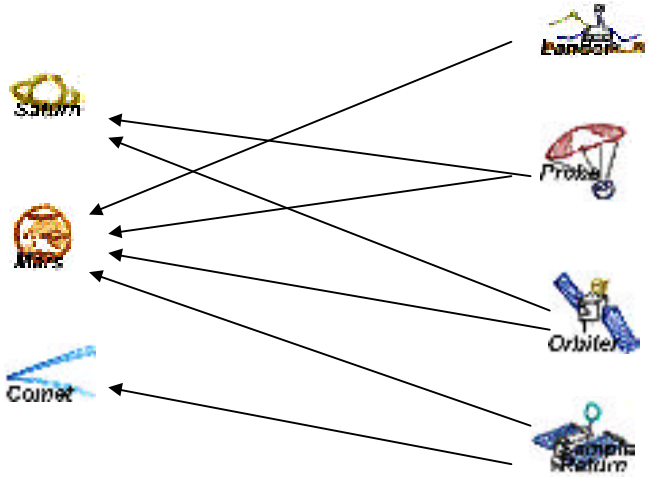


Three of the large gaseous planets of our Solar System (Jupiter, Saturn and Neptune) have amazing turbulent atmospheres. Even the atmosphere surrounding our Earth is a series of constantly evolving spirals and swirls.

The movement of gases within our atmosphere and oceans are studied by meteorologists, climatologists and oceanographers. Spacecraft such as TOPEX/Poseidon monitor the patterns of currents within the world's oceans. This helps them create models that can then be used in simulations. By creating models of our Earth we can obtain a greater understanding of the processes involved and the factors that influence it.

Task 4

Each planet has its own unique characteristics, as we found in Task 1. Therefore some spacecraft will be suited to particular targets. In theory it would be possible for all spacecraft to land, sample or probe each target, but the answers given are the most practical.



Lander

The lander needs some form of solid surface to *land* on. This therefore rules Saturn out. There are plans to land a spacecraft on the surface of a comet, but due to the comet's small size and unknown surface characteristics it would be hard to guarantee its surface upon landing.

Probe

Probes are suited to all locations. They may be a parachuting probe such as that used with the Galileo mission to Jupiter, or be hard hitting projectiles like Deep Space 2 currently targeted towards Mars. Probe instruments can send back information on the atmosphere as it gently parachute down, or pierce the surface to reveal information about sub-surface layers.

Sample return

Once again this would be possible for all three objects. The most likely is the comet, which is currently being undertaken by the Stardust mission. In 2004 it will pass through the coma (gas region surrounding the hard nucleus) and capture pieces of comet dust. A sample return mission from Mars is being planned for 2005-8. This will require a launcher from the surface of Mars and be a highly technical feat. To bring a sample of Saturn back

would require a toughened spacecraft capable of travelling through part of the Saturnian atmosphere and surviving its strong radiation field. While possible it may be a long way down the track.

Orbiter

An orbiter is used to map the surface of an object, search for minerals, water, etc. or observe its environment. The planets Saturn and Mars are ideal candidates for an orbiter (see Cassini and Mars Global Surveyor). Orbiting a comet however would be difficult because it has a very weak gravitational field.

Task 5

There are strictly no correct or incorrect answers, however there are limitations to what a spacecraft can do when exploring each planet. Once again it may be a good idea to combine the students answers on the board. The name of the spacecraft should reflect the mission and planet targeted (eg. Galileo is exploring the Jovian moons first seen by Galileo). Below is list of possible answers.

Planet	Type of Spacecraft	Studying	Name
Mercury	Lander	Soil Analysis	Hermes
	Orbiter	Solar Radiation	Wind
		Mineral sensing	Solar Explorer
Venus	Lander	Atmosphere	Cupid
	Orbiter	Rocks and Soil	CO2 sampler
	Probe		
Moon	All four	Soil	Green Cheese
		Solar Radiation	Astro Base 1
		Mineral Sensing	Luna C
		The Earth	
		Astronomy	
Mars	All four	Soil	War bird
		Water	Water Diviner
		Life	Red Rover
		Lack of Ozone Layer	
Jupiter	Probe	Atmospheric Studies	Jova
	Orbiter	Ring Systems	Jupiter Moon Hopper

		Moons	
		Radiation Fields	
Saturn	“	“	Saturn Ring Explorer
Uranus	“	“	Sideways Orbiter
Neptune	“	“	Atlantis
			Poseidon
Pluto	All four	Ice and other frozen compounds	Far away explorer
		The Sun	Yeti sample return